What is claimed is:

1. A semiconductor device manufacturing method comprising the step of:

plasmanizing a process gas containing any one of N_2 and N_2O; and

reforming a surface layer portion of a copper wiring layer to make the surface layer portion into a copper diffusion preventing layer by exposing a surface of the copper wiring layer to the plasmanized process gas.

2. A semiconductor device manufacturing method according to claim 1, wherein a hydrocarbon is added to the process gas.

3. A semiconductor device manufacturing method according to claim 2, wherein the hydrocarbon is any of CH_4 and C_2H_2.

4. A semiconductor device manufacturing method comprising the step of:

plasmanizing a process gas containing N_2 and NH_3; and

reforming a surface layer portion of a copper wiring layer to make the surface layer portion into a copper diffusion preventing layer by exposing a surface of the copper wiring layer to the plasmanized process gas.

5. A semiconductor device manufacturing method according to claim 1, further comprising the step of:

exposing the surface of the copper wiring layer to a NH_3 plasma before the surface layer portion of the

copper wiring layer is reformed.

6. A semiconductor device manufacturing method according to claim 1, further comprising the step of:

forming a silicon- containing insulating film on the copper wiring layer after the surface layer portion of the copper wiring layer is reformed.

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7. A semiconductor device manufacturing method according to claim 6, further comprising the step of:

plasmanizing a process gas containing at least one of NH_3, N_2, and N_2O; and

after forming the silicon-containing insulating film, exposing the silicon-containing insulating film to the plasmanized process gas.

8. A semiconductor device manufacturing method according to claim 6, further comprising the step of:

forming an interlayer insulating film on the silicon- containing insulating film;

forming a via hole in the silicon-containing insulating film and the interlayer insulating film;

burying a plug connected electrically to the copper wiring layer in the via hole; and

forming an upper wiring connected electrically to the plug on the interlayer insulating film.

9. A semiconductor device manufacturing method comprising the steps of:

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forming a silicon-containing insulating film on a copper wiring layer;

plasmanizing a process gas containing at least one of NH_3, N_2 and N_2O; and

reforming the silicon-containing insulating film by exposing the silicon-containing insulating film to the plasmanized process gas.

10. A semiconductor device manufacturing method according to claim 9, further comprising the step of:

exposing a surface of the copper wiring layer to a NH_3 plasma before the silicon- containing insulating film is formed.

11. A semiconductor device manufacturing method according to claim 9, further comprising the step of:

forming an interlayer insulating film on the silicon- containing insulating film after the silicon containing insulating film is reformed;

forming a via hole in the silicon-containing insulating film and the interlayer insulating film;

burying a plug connected electrically to the copper wiring layer in the via hole; and

forming an upper wiring connected electrically to the plug on the interlayer insulating film.

12. A semiconductor device manufacturing method according to claim 8 or claim 11, wherein the interlayer insulating film is any one of an FSG film and a porous SiO_2 film.

13. A semiconductor device manufacturing method according to claim 6 or claim 9, wherein the silicon-

containing insulating film is any one selected from the group consisting of an SiOCH film, an SiO film, an SiN film, an SiONCH film, an SiCH film, and an SiCNH film.

14. A semiconductor device manufacturing method according to claim 13, wherein the SiOCH film is formed by a chemical vapor deposition method using a reaction gas containing a compound having siloxane bonds.

15. A semiconductor device manufacturing method according to claim 13, wherein the SiONCH film is formed by a chemical vapor deposition method using a reaction gas containing a compound having siloxane bonds and N_2O.

16. A semiconductor device manufacturing method according to claim 14, wherein the compound having the siloxane bonds is any one selected from the group consisting of HMDSO ($(Si(CH_3)_3)_2O$), OMCTS ($(Si(CH_3)_2)_4O_4$), HEDS ($(Si(C_2H_5)_3)_2O$), TMDS ($(SiH(CH_3)_2)_2O$), TEDS ($(SiH(C_2H_5)_2)_2O$), TMCTS ($(SiH(CH_3))_4O_4$), and TECTS ($(SiH(C_2H_5))_4O_4$).

17. A semiconductor device manufacturing method according to claim 15, wherein the compound having the siloxane bonds is any one selected from the group consisting of HMDSO ($(Si(CH_3)_3)_2O$), OMCTS ($(Si(CH_3)_2)_4O_4$), HEDS ($(Si(C_2H_5)_3)_2O$), TMDS ($(SiH(CH_3)_2)_2O$), TEDS ($(SiH(C_2H_5)_2)_2O$), TMCTS ($(SiH(CH_3))_4O_4$), and TECTS ($(SiH(C_2H_5))_4O_4$).

18. A semiconductor device manufacturing method according to claim 13, wherein the SiN film is formed by

a chemical vapor deposition method using a reaction gas containing SiH_4 and N_2O.

19. A semiconductor device manufacturing method according to claim 18, wherein NH_3 is added to the reaction gas.

20. A semiconductor device manufacturing method according to claim 13, wherein the SiO film is formed by a chemical vapor deposition method using a reaction gas containing organic silane.

21. A semiconductor device manufacturing method according to claim 13, wherein the SiCH film is formed by a chemical vapor deposition method using a reaction gas containing organic silane and hydrocarbon.

22. A semiconductor device manufacturing method according to claim 13, wherein the SiCNH film is formed by a chemical vapor deposition method using a reaction gas containing NH_3, organic silane, and hydrocarbon.

23. A semiconductor device manufacturing method according to claim 20, wherein the organic silane is $TMS(Si(CH_3)_4)$.

24. A semiconductor device manufacturing method according to claim 21, wherein the hydrocarbon is CH_4 or C_2H_2.

25. A semiconductor device manufactured by the semiconductor device manufacturing method set forth in any one of claims 1, 4, and 9.